355.04
Extra
635 Ok

UNITED STATES DEPARTMENT OF AGRICULTURE

BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE

FOREST INSECT INVESTIGATIONS

RMD

FOREST INSECT SURVEY - SHASTA NATIONAL FOREST

Season of 1938

Annex 1
SB
763
.C2 S5
1938

R. C. Hall
Berkeley, California
March 4, 1939

U. S. GOVERNMENT PRINTING OFFICE 60918

Forest Insect Laboratory
Berkeley, California
March 4, 1939

FOREST INSECT SURVEY - SHASTA NATIONAL FOREST

Season of 1938

APPROVED BY:

J. M. MILLER
Senior Entomologist, In Charge

SUBMITTED BY:

R. C. HALL
Assistant Entomologist

TABLE OF CONTENTS

INTRODUCTION 1

SURVEY PROCEDURE 1

CHARACTER OF THE 1938 INFESTATION 1

BASIS FOR 1938 ESTIMATE 1

COMPOSITION OF THE INFESTATION 2

GROUPING 2

INSECT CAUSED LOSSES IN PINE 2

INSECT CAUSED LOSSES IN SPECIES OTHER THAN PINE 5

LOSSES OTHER THAN INSECT CAUSED 5

EFFECT OF PREVIOUSLY TOPKILLED TREES 5

LOSSES ON CUTOVER AREAS. 5

DISTRIBUTION OF LOSSES BY TREE CLASSES 5

SUMMARY AND RECOMMENDATIONS 9

FOREST INSECT SURVEY - SHASTA NATIONAL FOREST

Season of 1938

INTRODUCTION

The annual forest insect survey for the Shasta National Forest was conducted by members of the Forest Insect Laboratory during the months of October and November, 1938. The field survey was under the direction of R. C. Hall, assisted by W. D. Hagenstein and C. S. Badman. This survey consisted of a 100 percent loss cruise on 2,880 acres, comprising 6 virgin and 4 cutover permanent sample plots, the location of which is shown on the enclosed map.

It should be mentioned that the present sample plot system for the Shasta National Forest is considered inadequate in that the virgin plots are all located in the South Shasta and the cutover plots in the North Shasta. This leaves a considerable area which is not sampled by plots or reconnaissance. For that reason the data presented below are thought to have rather limited application. The discussion of virgin plot loss will probably apply only to the South Shasta in the Fall River Mills area, and the cutover data to the North Shasta in the vicinity of Tennant. The present Regional Survey plans call for an extension of the sample plot system in the near future to more adequately sample the Shasta National Forest.

SURVEY PROCEDURE

The method employed in 1938 was standard survey procedure for the California region. Losses in species other than pine were also cruised, and records were taken for windfall loss.

CHARACTER OF THE 1938 INFESTATION

The present indications are that the insect losses for the Shasta National Forest will be approximately double that for the 1937 season. A marked tendency for grouping was observed on practically all virgin plots. There has been an increase in western pine beetle activity during 1938 and a decrease in flathead activity.

BASIS FOR 1938 ESTIMATE

Only partial loss records are available for 1938 due to the fact that many of the 1938 winter generation trees had not started to fade at the time of the fall cruise. It is necessary each year to make an adjust-

ment for this condition in order to arrive at an estimated loss figure for the year. It was assumed that approximately 60 percent of the 1938 total loss was cruised during the past fall and the 1938 estimated figures are based upon that assumption.

COMPOSITION OF THE INFESTATION

The major changes in the composition of the infestation in 1938 over that in 1937, as shown from basal examination, was the decline in flathead activity and an increase in western pine beetle work. In 1938, about 96 percent of the volume loss was associated with the presence of pure broods of the western pine beetle in the basal portion of the tree. The basal examination is not as reliable a measure of insect activity as is an examination of the entire bole of a felled tree, but in years such as the past where the western pine beetle is the main agent of destruction, it serves as a useful index.

GROUPING

There was a definite grouping tendency observed on practically all virgin Shasta plots. The average size of the groups in the Shasta was approximately 4 trees, although one group of 25 trees was observed. In the large majority of cases, a decadent tree, usually an old topkill, was instrumental in initiating groups, and it is expected that much of the 1938 loss might have been avoided if this type of tree had previously been removed from the stand.

INSECT CAUSED LOSSES IN PINE

Table I offers a comparison of sample plot losses in pine for three years 1936, 1937 and 1938. These losses are presented on a per section and per acre basis, together with the ratios of the current year's loss to that of the preceding year. It may be noted that the ratios are less than one for 1936 and 1937 indicating a declining cycle. The 1938 ratio of over 2 indicates a marked increase over 1937. The 1937 loss represents the lowest point reached in the past loss cycle, and it is apparent that an upswing has started for 1938. Whether this will continue in 1939 is a matter of conjecture. The disturbing thing about the 1938 infestation is that although the probable average loss is only slightly over 2 times that of 1937, there are two plots where it is over 6 times greater than in 1937. The range in estimated 1938 plot losses is from a high of 171 board feet per acre for plot 4 to a low of 6 board feet per acre for plot 3. Only limited data on growth are available for the South Shasta, but based on these incomplete data, it is expected that the average loss for 1938 will not exceed the average increment.

TABLE II.

PLOT LOSSES, SHASTA NATIONAL FOREST - FIRE

Plot No.	1936 Per Section No. trees	1936 Per Section Volume B.M.	1936 Per/A Vol. B.M.	1936 Ratio 36/35	1937 Per Section No. trees	1937 Per Section Volume B.M.	1937 Per/A Vol. B.M.	1937 Ratio 37/36	1938 Estimated Per Section No. trees	1938 Estimated Per Section Volume B.M.	1938 Estimated Per/A Vol. B.M.	1938 Estimated Ratio 38/37
SH-1	12	19,200	30	.25	43	16,190	24	.84	149	91,390	143	6.08
SH-2	20	72,700	113	.38	43	27,000	42	.37	53	31,360	49	1.16
SH-3	36	25,340	39	.62	107	11,970	19	.47	53	3,840	6	.32
SH-4	66	78,080	122	.29	309	68,100	106	.87	373	109,380	171	1.61
SH-8	Not cruised in 1936				117	12,800	20	--	117	83,720	131	6.54
SH-9	42	23,220	36	.64	213	29,250	46	1.26	107	34,430	54	1.18
Aver.	35	43,710	68	.44	139	27,550	43	.63	142	59,020	92	2.18

TABLE II

INSECT LOSSES IN SPECIES OTHER THAN PINE, 1937 and 1938.

Per Acre Basis.

Plot	Species	1937		1938 Estimated	
		Number	Volume B.M.	Number	Volume B.M.
SH-1	Douglas Fir			.01	1
	White Fir	.51	18		
SH-2	White Fir	.03	43	.01	6
	Incense Cedar				
SH-4	Douglas Fir			.01	4
	Incense Cedar	.01	1	.01	1
Aver.	Douglas Fir			.01	2
	White Fir	.02	20	.01	2
	Incense Cedar	.01	1	.01	1

INSECT CAUSED LOSSES IN SPECIES OTHER THAN PINE

In 1937 the practice was started of cruising losses in all tree species and this was continued in 1938. Insect caused losses for 1937 and 1938 in other species is presented in Table II. White fir, Douglas fir and incense cedar constituted the species cruised in order of the magnitude of the total loss.

LOSSES OTHER THAN INSECT CAUSED

Losses other than insect caused were made up of windfalls. This factor, however, was of little importance in the Shasta, as less than .2 percent of the total drain was caused by windfalls. Windfall however, did contribute a considerable amount of loss in both the Lassen and Modoc.

EFFECT OF PREVIOUSLY TOPKILLED TREES

Previously topkilled trees entered to a large degree into the current 1938 loss, where this class of decadent tree alone made up over 70 percent of the total loss (Table III). The indirect effect of topkills in the 1938 loss is of additional importance because in a large percentage of cases, this type of tree served as the focal point in group infestation, where the insects first attacked a topkill and then overflowed into adjacent vigorous trees. If this type of tree could be removed from the stand in the Shasta, it is expected that subsequent losses due to insects would be greatly reduced. The average volume of topkilled trees was approximately 2,700 board feet compared to approximately 600 board feet in those trees without top injury (Table VI). It is recognized that the occurrence of topkills in the 1938 loss may be a temporary feature of the present infestation and further data are needed on the occurrence of this type of tree in the green stand.

LOSSES ON CUTOVER AREAS

Unfortunately the present cutover plots are all located in the North Shasta and it is expected that the results from these plots can not be applied elsewhere. A summary of losses for these cutover plots is presented in Tables IV and V. On all plots except CO-4, which is definitely in the fringe type, the balance between loss and increment is very favorable. On CO-4, however, the loss for 1938 is about 4 times the annual increment.

DISTRIBUTION OF LOSSES BY TREE CLASSES

Table VI presents a distribution of the cruised sample plot losses for 1938 by Dunning tree classes. This loss has been segregated

TABLE III

VOLUME LOSS MADE UP OF PREVIOUSLY TOPKILLED TREES
Shasta National Forest - 1938

Plot	Volume per Acre	Percent of Total Loss
SH-1	93	64.8
SH-2	46	94.8
SH-3	0	0
SH-4	126	73.9
SH-8	112	85.6
SH-9	24	45.0
Average	67	72.8

TABLE IV

LOSSES ON CUTOVER AREAS - NORTH SHASTA
Per Acre Basis

	1937		1938	
Plot No.	Number	Volume B.M	Number	Volume B.M.
CO-1	.05	21	.07	35
CO-2	.01	5	.02	3
CO-3	.01	0.5	0	0
CO-4	.37	66	.15	28
Average	.11	23	.06	17

TABLE V

NORTH SHASTA CUTOVER PLOTS - PINE

RESIDUAL STAND, INCREMENT AND INSECT LOSS, SEASON 1938

Plot No.	Volume B. M. per Acre		
	Residual Stand	Average Growth per Acre	1938 Loss, Estimate
CO-1	3,410	65	35
CO-2	1,323	21	3
CO-3	305	15	0
CO-4	557	7	28
Average	1,481	27	17

Increment - Average Annual Growth Percent of Residual Stand	1.8
Depletion - Insect Loss, Percent of Residual Stand 1938	1.1
Depletion-Increment Ratio	.6

TABLE VI.

DISTRIBUTION OF 1938 CRUISED PLOT LOSS ACCORDING TO DUNNING TREE CLASSES

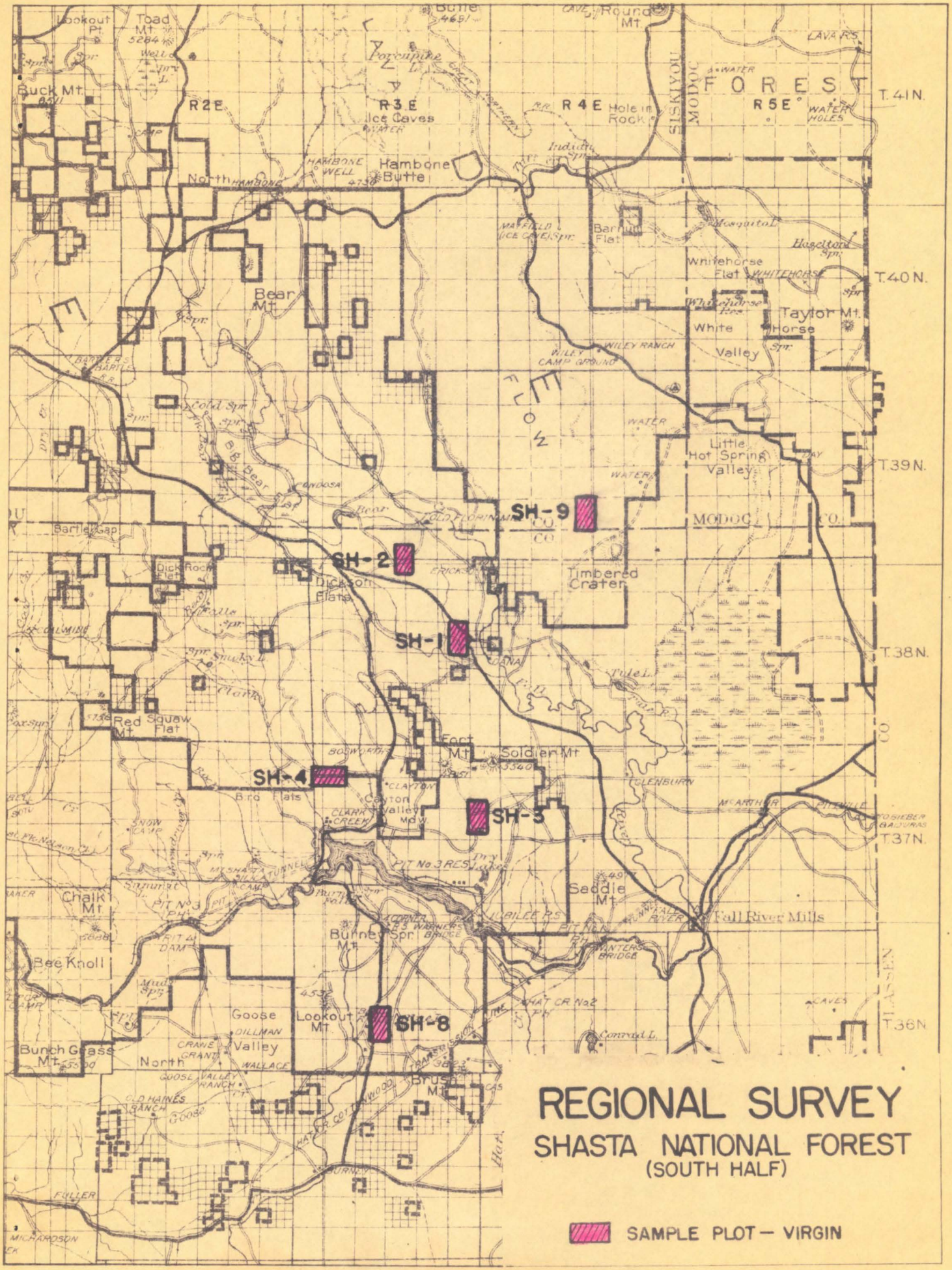
Dunning's Tree Class	Trees with previous top injury			Trees without top injury			All trees		
	Percent of Total Loss Volume B.M.	No. of Trees	Size of Ave.tree Vol.BM	Percent of Total Loss Volume B.M	No. of Trees	Size of Av.tree Vol. BM	Percent of Total Loss Volume B.M.	No. of Trees	Size of Av.tree Vol.BM
1	0.5	1.2	440	0.3	2.6	170	0.8	3.8	260
2	-	-	-	0.1	1.2	120	0.1	1.2	120
3	2.3	2.6	1.145	4.6	14.1	430	6.9	16.7	540
4	0.2	1.2	240	5.9	25.7	300	6.1	26.9	300
5	69 3	30.8	2.950	16 4	16 7	1.260	85.7	47.5	2.350
6	-	-	-	0.3	2.6	170	0.3	2.6	170
7	-	-	-	0.1	1.3	150	0.1	1.3	150
Total	72.3	35.8	2.650	27.7	64.2	560	100.0	100.0	1.300

into classes with and without previous top injury to illustrate that such decadent trees have much greater average volume than those without injury. It is interesting to note that 85.7 percent of the cruised volume loss for 1938 occurred in Dunning's tree class 5, with class 3 containing 6.9 per cent; class 4, 6.1 percent and the balance of 1.3 percent occurring in classes 1, 2, 6 and 7.

SUMMARY AND RECOMMENDATIONS

There has been a definite tendency toward grouping in the 1938 infestation, on practically all areas in the South Shasta. It is expected that the 1938 plot loss will be double that of 1937, and will be approximately 92 board feet per acre compared to 42 for the previous season. 1937 represented the low peak in the past infestation cycle. An upswing is definitely indicated for 1938; whether or not this upward swing will continue in 1939 is a matter of conjecture. The stage appears to be set for such an upswing if other factors are favorable, because there is 4 times as much volume carrying overwintering generations of the western pine beetle in 1938 as was present at approximately the same date in 1937.

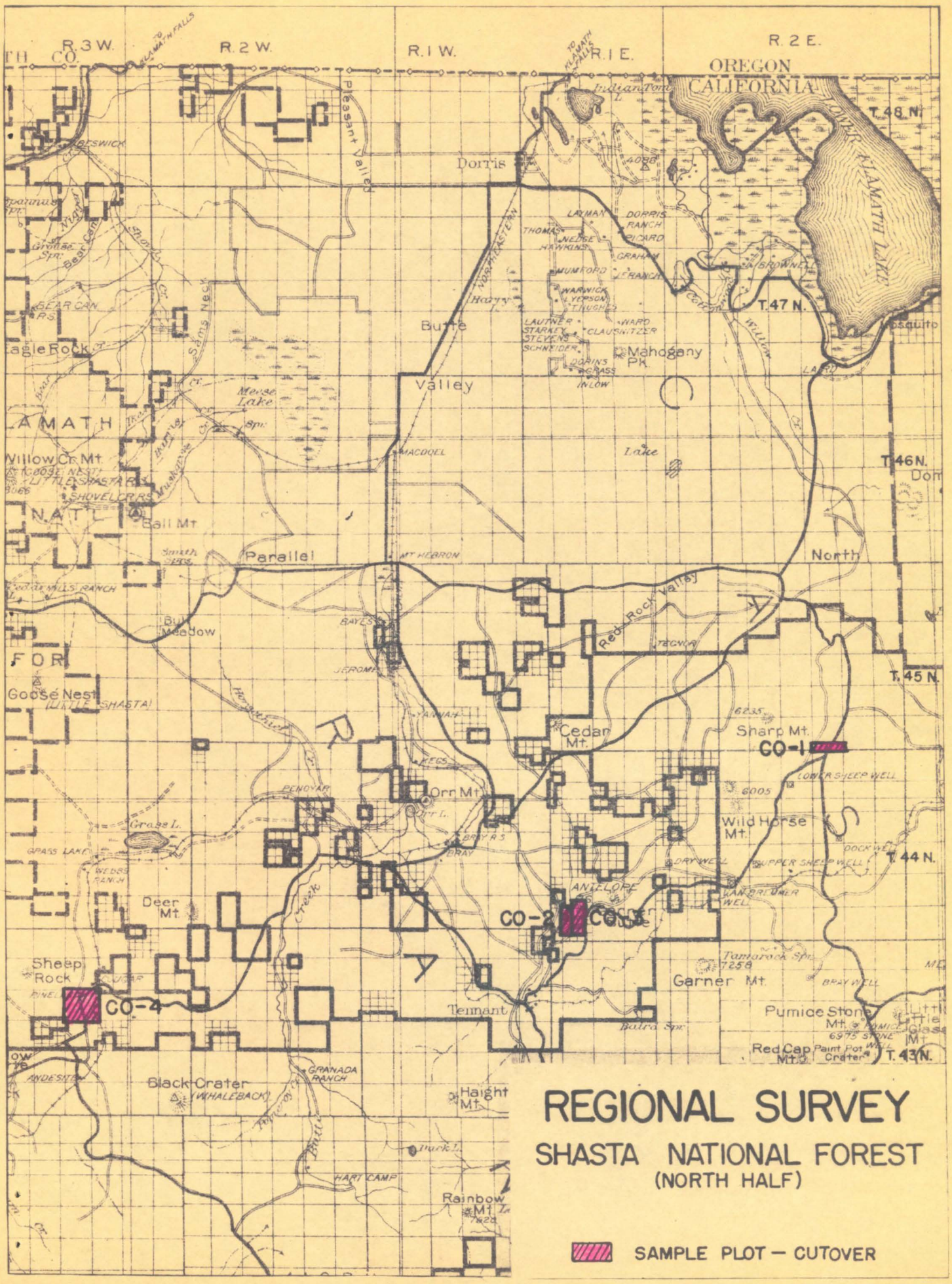
Control is not recommended for the Shasta unless it could be worked into a program of a sanitation cutting which would remove all topkilled and other decadent trees from the stand. Such a cutting in the Shasta might be economically feasible because in that area the topkilled trees which were cruised in 1938 were predominantly large trees with an average volume of over 2,500 board feet. It is expected that these trees would contain lumber of high value. Such an operation, if carried on over extensive areas is expected to greatly reduce subsequent losses in this area.



REGIONAL SURVEY

SHASTA NATIONAL FOREST
(SOUTH HALF)

SAMPLE PLOT — VIRGIN



REGIONAL SURVEY

SHASTA NATIONAL FOREST
(NORTH HALF)

SAMPLE PLOT — CUTOVER